

WASHINGTON

# SCIENCE TRENDS

HIGHLIGHTS

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## Space Age Ceramics

A broader research base for future defense applications of ceramics and other non-metallic materials is indicated by John R. Townsend, Special Assistant to the Director of Defense Research and Engineering, U. S. Department of Defense. Reporting to the American Ceramic Society, the Pentagon official indicates a number of development trends:

- \* Ceramic Information: Defense Department is studying the possibility of a national information center on ceramic materials, similar to those already established for Defense Metals, and Plastics.
- \* Central Processing: Defense Department is considering the possibility of establishing a central processing facility for ceramics and refractory materials. Estimated cost of this installation would be \$7 million.
- \* Ductile Ceramics: The problem of brittleness, which has prevented full use of the heat-resistant qualities of ceramics, requires additional R&D support. There is some belief in the Defense Department that one way of solving such problems may be in the alteration of the composition of ceramic materials to increase ductility and ease fabrication. This suggestion, based upon experience of the Atomic Energy Commission, relates to the possibility of compositions based on thorium, yttrium and rare earth compounds having the desired physical and chemical properties.
- \* Research Areas: Other areas of future promise include research on high temperature ceramic cements for gas-tight enclosure; effects of radiation and temperatures from 1000°F and up; compatibility of ceramics with exotic fuels; nature of the bond between ceramics and metals; application of bonding ceramics to metal as coatings to withstand high temperatures, radiation erosion and corrosion; additional data on rare earth oxides for use as high temperature refractory materials; study of refractory carbides; possible increase in ability of ceramics to withstand shock by refining grain size; semiconductor materials prepared from rare earths and stable at high temperatures with good thermoelectric properties; study of the magnetic properties of rare earth elements for special communication applications; The use of rare earths as polishing compounds for glass; simplified process for fabrication of radomes nose cones, insulation coatings, adhesives, rocket nozzles and similar applications and the development of ceramics for structural and semi-structural components for use up to 3500°F.

## Defense Technology Spending

The powerful and usually decisive Military Appropriations Subcommittee of the House of Representatives has voted for a number of substantial changes in defense programs involving science and technology. These changes are subject to further review by the House and Senate.

Compared with the Budget requests (Washington SCIENCE TRENDS, Jan. 18, 1960)

### \*Programs Increased Include:

Army Modernization -- \$207.6 million more than requested to permit procurement of more new M-14 rifles and ammunition, new machine guns, additional armored personnel carriers and tanks with fire control equipment, over 6,000 additional Davy Crockett Weapon systems and 13,000 additional chemical rockets and multiple launchers.

Airlift -- An additional \$250 million for procurement of a new modern airlift aircraft, for development of a commercially compatible cargo aircraft, and for 50 more modified C-130B aircraft. Also procurement of side-loading type cargo aircraft such as the KC-135.

Airborne Alert -- An additional \$115 million for extra engines, parts, etc.

Minuteman - An additional \$20.7 million to speed development of mobile capability for this solid propellant Air Force Missile.

Polaris Submarines - An additional \$241 million for submarines and missiles.

ASW - An additional \$321 million including three nuclear attack submarines, two destroyer escort vessels and an additional \$100 million for R&D.

Space - An additional \$54 million to speed work on Midas, Samos and Discoverer satellite projects. All relate to reconnaissance-missile warning.

### \*Programs Reduced Include:

Aircraft Carrier - The conventional carrier, at \$293 million is deleted.

Communications - Some \$84.3 million is taken from funds for this purpose to encourage the military to speed work on joint communications.

Bomarc - Cut from this and prior years -- \$675.1 million. Committee says tests "have done nothing to justify confidence in this program" and eliminates all but \$50 million for further developmental tests and evaluations "if necessary."

### \*New Program

F-106 -- The legislators vote \$215 million for the additional procurement of two squadrons of the F-106 Convair Delta Dart manned interceptor as a partial replacement for the Bomarc air defense program.

\*Among major recommendations: "Dramatic and dynamic" leadership for a Navy ASW program...Careful scrutiny and control of basic research programs, particularly where new facilities and equipment is involved....A careful review of the aircraft nuclear propulsion project including cancellation if the concept is unsound, or replacement of contractors or administrators, if necessary.

### Corner Reflecting Antennas

Studies for the U.S. Air Force indicate that corner-reflector antennas have advantages in high gain, broad frequency response, narrow beam width, low back radiation and low cost plus ease of construction.

The National Bureau of Standards, at its Boulder Colorado Laboratories, has completed a performance study of such antennas. The results demonstrate how gain varies with the changes in width and length of reflecting surfaces, as well as the angle of aperture and position of the driven element.

The antennas are said to be particularly suitable for work in ionospheric scatter propagation and related communication systems.

(Further details available. Single copies free. Write National Bureau of Standards, Office of Technical Information, Washington 25, D.C. for STR - Design of Corner Reflector Antennas)

### New Welding Flux

Difficulties with welding submarine hulls of HY-80 structural steel have led to development of a new welding flux which is said to bring promise of greater efficiency and lower production costs.

The experimental flux was required because of high oxygen contents and numerous silicate inclusions in submerged arc welds. At the present time almost all welding of HY-80 steel is being done manually with coated electrodes to assure desired notched toughness.

The new flux, less acid because it contains relatively little silica and an exceptionally large amount of calcium oxide, is reported to bring welds of excellent yield strength, tensile ductility and notch impact values. Future plans call for evaluation under semi-production conditions.

(R&D for Bureau of Ships, U.S. Navy. Reported by P.J. Rieppel, Chief, Metals Joining Division, Battelle Memorial Institute, Columbus 1, Ohio)

### Electronic Survey System

Army Engineers are evaluating an electronic survey system which can be used to measure inter-island and other geodetic ties where line-of-sight conditions do not exist, and for establishing the position of boats, aircraft and land vehicles.

System uses a continuous wave unmodulated radio transmission sent out from each end of the line to be measured. For positioning, two baselines extend from a central transmitting station, with a transmitter at each end of the baselines. Both measurement and positioning employ aircraft-mounted receiving stations.

(R&D by Lorac Service Corp, Tulsa, Oklahoma. Reported by Technical Liaison Office, U.S. Army Engineer Research and Development Laboratories, Ft. Belvoir, Va.)

### Royalty-Free Patent Checklist

Here is a new listing of Government-owned patents now available for use by industry on a royalty-free basis. Subscribers desiring further information may write Service Department, Washington Science Trends, 1120 National Press Building, Washington 4, D.C.

You will be furnished with the patent number and classification, and information on where to obtain the patent, and where to apply for royalty-free licensing.

- ( ) Automatic Data Conversion: This patent covers a system for converting data recorded in curvilinear form on a chart into another type of record which is said to permit rapid analyzation by mechanical means.
- ( ) Ratio Voltmeter: This meter is designed to determine the ratio of two voltages having different frequencies.
- ( ) Battery Pack Device: Designed for ordnance applications, this device features a battery pack in which each cell, or group of cells is connected initially by a detachable multicontact plug. All cells can be charged to capacity or discharged, as desired.
- ( ) Transistor Unit: In this patent, a transistor unit is mounted in a printed circuit plate with junction contacts electrically connected to appropriate printed circuit leads. A maximum diameter of less than one-tenth of an inch is reported for the transistor unit.
- ( ) Synthetic Lubricant: Additives are used here to make the lubricant useful under extreme conditions. The product is said to be particularly designed for high-powered turbines used in submarines and torpedoes.
- ( ) Aircraft Fuel Tank System: Design features covered in this patent are said to prevent the formation of explosive air-gas mixtures in the vicinity of aircraft fuel tanks.
- ( ) Metal Density Measurement: This apparatus is said to aid in the determination of the density of lighter metals, such as aluminum or magnesium.
- ( ) Titanium Cylinder Device: The apparatus covered by this patent is said to extrude hollow cylinders of titanium by piercing punch and die means.
- ( ) Electronic Module Mount: This patent covers a mounting device for electronic modules, and is said to provide a ready connection between the mounting device and a chassis.
- ( ) Mass Flowmeter: This device is said to be useful for measuring the flow of gas, liquids and granular material.
- ( ) Liquid Level Telemetering: This patent covers a portable device which can measure the level of lakes, rivers and other bodies of water and transmit the information to a remote receiver.



## Research Checklist

- ( ) Rocket-Borne Radiosonde: Weather data up to 40 miles altitude, twice the height of weather balloons, will be gathered by the Army with a new rocket-borne radiosonde to be procured from Atlantic Research, Inc., Alexandria, Va. The 6½ pound device will gather wind speed and temperature data and incorporates a radio transmitter and silver-zinc batteries in an 18-inch fiberglass shell. The system is said to be more economical and flexible than the larger rocket systems currently used for higher altitude soundings.

(Equipment developed by U.S. Army Signal Research and Development Laboratory, Ft. Monmouth, N.J.)

- ( ) Miniaturized Thickness Gages: Two new miniaturized gages have been designed for the U.S. Army which are said to make possible the accurate measurement of coating thickness inside small-diameter tubes. Although originally designed for measuring chromium plating in the bores of small gun barrels, a number of other uses, such as measurement of tubing for various chemical process applications are anticipated. The gages make use of the reflected field from eddy currents induced in the specimen and are, of course, non-destructive.

(Further details available. Single copies free. Write National Bureau of Standards, Office of Technical Information, Washington 25, D.C., for STR-Miniaturized Thickness Gages)

- ( ) Solid Propellant Mixtures: A number of advantages are said to result from the mixing of "dry ice" in the processing of solid propellants for rockets. Dumping the solidified carbon dioxide into the mixture is said to reduce mixing time by 30 percent while improving extrusion characteristics and reducing the amount of grain swell. Reject rates are said to be 20 percent lower. Dumping 50 pound batches of crushed dry ice directly into the propellant mixture is said to cool the 450-pound mix used to about 80° F.

(R&D by Solid Propulsion Operations, Rocketdyne Corp., McGregor, Tex.)

- ( ) High-purity Chromium: Sheets and wires of high-purity chromium can be produced through electrolysis according to studies by the Bureau of Mines Metallurgy Research Center, Albany, Ore. Research indicates that this metal has superior ability to withstand effects of high temperatures, and thus should ultimately find uses in aviation, ballistics and similar fields.

(Report available. Single Copies free. Write U.S. Bureau of Mines, Publications-Distribution Section, 4800 Forbes Avenue, Pittsburgh 13, Pa., for Report of Investigation No. 5589)

- ( ) Electronic Wool Measurement: A device developed for the U.S. Department of Agriculture is said to be the first capable of measuring the staple length of so-called grease wool. Results are printed on standard adding machine tape. The device will receive a field trial this year from the Department's Denver Wool Laboratory.

### Publication Checklist

- ( ) Space Program Review, a transcript of hearings before a Congressional Committee and featuring testimony by research and development administrators in the Department of Defense and the National Aeronautics and Space Administration. 539 pages. Single copies free. (Write Committee on Science and Astronautics, George Washington Inn, House of Representatives, Washington 25, D.C., for Review of the Space Program, Part I)
- ( ) U.S. and U.S.S.R. Science Education, a review of a National Science Foundation study on the relative merits of scientific education in these two countries. 74 pages. Single copies free. (Write Committee on Appropriations, U.S. House of Representatives, The Capitol, Washington 25, D.C., for Hearings, National Science Foundation, Comparison of U.S. and U.S.S.R. Science Education)
- ( ) Receiving Tubes, a tabulation of data on Receiving-type electron tubes. Includes some characteristics of each type in a numerical and characteristic listing. Prepared by the Government in 1959 and now available. 110 pages. \$1. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Publication No. C 13.11:68)
- ( ) Science and Engineering in American Industry, the results of a 1956 survey now available. Covers cost of R&D by industry and by company size; expenditures for R&D by Government and Industry; employment of scientists and engineers and a great deal more similar information. 117 pages. 70 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C., for Pub. NSF 59-50)
- ( ) Science in Space -- The Earth, another in a series of Reports in Progress under the auspices of the Space Science Board. This chapter covers space experiments relating to Earth Geodesy, meteorology and the upper atmosphere. Includes a list of references and suggestions for supplementary reading. 36 pages. \$1. (Write Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington 25, D.C., for Science in Space, Chapter III)
- ( ) Storage Battery Industry, a Census Bureau report for 1958 now available covering general statistics for the storage battery industry, showing that shipments increased by seven percent in a four-year period. 4 pages. 10 cents. (Available at Field Offices, U.S. Department of Commerce, or write Publications Office, U.S. Bureau of the Census, Washington 25, D.C., for Industry and Product Report MC(P) -36D-2)
- ( ) Radioisotopes in Science and Industry, a comprehensive report on the peaceful uses of radiation and reactor byproducts citing major uses of radioisotopes in a number of fields. 176 pages. \$1.25. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C., for Radioisotopes in Science and Industry)
- ( ) Sandwich Construction, an excellent report by Stanford Research Institute for the Navy on the Present Status of and Future Outlook for, All-Metal Sandwich Construction for Air Vehicles. Covers Design, Manufacturing, Inspection and Quality Control and Requirements Vs. Capacity. 133 pages. \$2.75. (Write OTS, U.S. Department of Commerce, Washington 25, D.C., for PB 161 099, dated August, 1959 and now available.)

